Use of AI Tools for the Meaningful Learning of Mathematics

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Abstract:

Artificial Intelligence (AI), also known as generative AI and large language models, has steadily emerged as a transformative force across various sectors of daily life, including education. Mathematics, a discipline fundamental to fields such as science, engineering, and beyond, has particularly benefited from this evolution (Zreik, 2024; Harry & Sayudin, 2023). AI's capabilities to personalise learning, automate tasks, and provide real-time feedback have sparked growing interest in its potential to enhance meaningful learning in mathematics at both the school and higher education levels (Darmayanti, 2024). However, the integration of AI into education also raises critical questions regarding its effectiveness, accessibility, and ethical implications (How, & Hung, 2019). This editorial examines the potential impact of AI tools on fostering deeper understanding in mathematics, while also addressing the challenges associated with their implementation.

Mathematics is a crucial skill that underpins both education and everyday life. It empowers individuals with problem-solving abilities, quantitative literacy, and the capacity to navigate an increasingly data-driven world. Additionally, mathematics opens doors to career opportunities, enhances critical thinking, nurtures creativity, and supports personal development (Li, Gould, & Zaki, 2024; Harry & Sayudin, 2023). It also fosters mental discipline and plays a key role in many daily activities (Pedró, 2020; García-Martínez et al., 2023). Within education, mathematics provides a foundation for understanding the world and equips individuals for a wide range of academic and professional paths.

However, despite its significance, many students struggle with both internal and external mathematics assessments. Research has identified several reasons for this underperformance (Darmayanti, 2024). These include weak foundational knowledge, teaching methods that fail to address diverse learning styles, insufficient personalised support to match individual learning paces, maths-related anxiety, difficulty seeing the real-world relevance of mathematical concepts, inadequate practice leading to poor retention and lower confidence, a curriculum that advances too quickly, limited access to necessary learning resources, a negative mindset, and external factors such as personal or family challenges that hinder focus (Grájeda et al., 2024).